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APPALACHIAN FOREST EXPERIMENT STATION

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MINIMIZING GLAZE DAMAGE IN PINE

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The glaze[1/] storm of January 27-29, 1943, in Virginia and North Carolina brought many inquiries on how to prevent glaze damage. Severe glaze storms, such as occurred this past winter all the way from Maine to North Carolina, damage forest trees and at times the losses are enormous. Because these damaging storms occur on the average about once a decade in areas subject to glaze storms, they must be considered in managing timber stands. Our data on these storms are incomplete, but for southern yellow pines in North Carolina and Virginia, one point stands out definitely: stocky, heavy boled pines are resistant while slender, tall pines are likely to be heavily damaged.

Damage

Damage in a glaze storm is likely to be variable and spotty because many factors are involved, such as the amount of local rain when conditions are favorable for glaze formation, amount of wind, support or protection by other trees, the type of tree, and which way a broken top falls.

In southern yellow pines in North Carolina and Virginia, damage consists of bending, uprooting, and top and bole breakage. Branch breakage in pine is light or negligible while in hardwoods limb damage is always serious. A possible explanation may be that the excurrent type of growth of pine transmits stresses more directly to the bole than does the deliquescent type of growth of most hardwoods. As a result of the larger number of branch orders, greater stresses are built up before reaching the main stem.

1/Glaze is a layer of ice formed when rain, sometimes supercooled, freezes on objects whose temperature is at or slightly below the freezing point of water.

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Pine reproduction up to about 12 feet in height usually weathers a glaze storm without much damage. Bending may be severe but after the ice melts most of the trees straighten to such an extent that permanent damage is negligible.

In pine stands 2-6 inches d.b.h., severe bending is the prevalent type of damage, especially in dense stands where the trees are slender. Figure 1 shows typical bending and partial uprooting common in dense young stands. These trees will not straighten. On the other hand, trees of this size, which have not been crowded and have developed into stocky individuals with vigorous crowns, withstand glaze storms better; damage is light and consists mainly of slight bending and a little top breakage.

Figure 1.--Typical bending and partial uprooting in dense sapling pine stands. These trees will not straighten.

The most prevalent type of damage for trees 6-10 inches d.b.h. is bole and top breakage, with uprooting heavy at times. In dense stands where the trees are slender and small topped, bole breakage may be severe and uprooting (Fig. 2) serious on low ground. Thinning in dense stands of this size is undesirable because the weak trees, deprived of mutual support, are severely damaged (Fig. 3). In cutover stands, more than half of the spindly overtopped and intermediate trees left to grow for future cuts are broken or badly bent by subsequent glaze storms. Uncrowded stands composed of sturdy trees with good tops withstand glaze storms comparatively well. In damaged stands and in cutover

Figure 2.--On low ground serious uprooting as well as bole breakage is common in dense polewood pine stands.

Figure 3.--Bole breakage in thinned stands is severe when the trees are tall and slender.

areas the undamaged trees are usually the stockier ones with better crowns. Apparently a vigorous, compact crown is an advantage in that it is associated with heavier boles.

Trees 10 inches d.b.h. and larger are usually sturdy dominants and codominants in most stands. Damage is light and more or less restricted to weaker trees of the lower diameters. Strong seed trees stand up well.

Prevention

Inasmuch as slender, small-topped trees are severely damaged while stocky, heavy-boled, vigorous trees are relatively resistant, we should aim at stands of trees of the latter type. This is easier said than done. It cannot be emphasized too strongly that stands of timber neglected for long periods cannot be changed overnight, figuratively speaking, when they acquire certain undesirable characteristics. Stand improvement is a gradual process which should start early.

Thinning at the right time is a great aid in obtaining a well-spaced stand of vigorous, fast-growing trees. Thinning too late or too little may be useless or worse than none at all. Young stands that are overly dense must be thinned early, because in dense stands differentiation into the various crown classes proceeds slowly, and the trees become tall, slender, weak, small-topped, and mutually dependent for support and protection. When this point has been reached, thinning is inadvisable because these trees are no longer able to stand alone. It would be many years before the remaining trees would increase the size of their crowns, begin rapid growth, and develop strong boles able to withstand occasional storms. Cutting suppressed trees will not aid the overstory. Thinning should remove intermediates and poorer codominants to release the better trees--the ones that can take advantage of release, increase the size of their crowns, increase their growth rate, and develop stockier boles. Thinning must give the remaining trees more crown space.

Similarly in older stands, any system of management which cuts the best and largest trees, leaving intermediate and overtopped trees for future growth involves much risk. These trees that have fallen behind have become relatively tall, slender-boled, and small-topped. They cannot respond quickly to release and are subject to damage from the elements when the protecting larger trees are cut. If a method of partial cuttings is desired, then they should be begun early enough to allow residual trees enough growing space to develop normally. But if the stand has gone so far without management that the trees to be left are weak individuals, it is better to clear-cut and leave strong seed trees to restock the area.

To minimize damage from glaze, we recommend the following measures:

1. Dense stands averaging 6 inches d.b.h. or less should be thinned now. If very dense, thin lightly at first, more heavily later.

2. Thin moderately dense stands averaging more than 6 inches d.b.h.

3. Do not thin any dense stand averaging more than 6 inches d.b.h. in which the trees are tall, slender, small-topped, weak individuals, in the hope of improving the stand or the growth rate. There is a strong likelihood that natural losses other than glaze damage would more than balance any gain due to increased growth; and with lessened mutual support and protection, these weak trees would be that much more susceptible to storm damage. These stands may be held for further increment and then clear-cut, leaving seed trees. If no weather firm trees are available, planting is necessary.

4. Do not leave any weak trees for future growth in any system of partial cuttings. Leave only sturdy individuals able to stand alone.